

Danqing Wang

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EDUCATION

- Max Planck Institute for the Science of Light** 2023 –
Postdoctoral Fellow
Division: Vahid Sandoghdar
- University of California, Berkeley**, Berkeley, CA 2019 – 2023
Miller Research Fellow
Faculty host: Junqiao Wu
Department of Materials Science and Engineering
- Northwestern University**, Evanston, IL 2019
Ph.D. in Applied Physics
Co-advisors: Teri W. Odom, George C. Schatz
Thesis: *Manipulating Light-Matter Interactions with Plasmonic Nanoparticle Lattices*
- Nanjing University**, Nanjing, China 2013
B.S. in Physics

FELLOWSHIPS & AWARDS

- 2023 Rising Stars of Light (3 awardees, before faculty track)
- 2022 Rising Stars in EECS, USA
- 2020 Forbes 30 Under 30 in Science
- 2019 Miller Research Fellowship, University of California, Berkeley
- 2018 Material Research Society Graduate Student Award (GSA) Silver Award
- 2018 Excellent Poster Award, Gordon Research Conference on Lasers in Micro, Nano and Bio Systems
- 2018 Honorable Mention, International Precious Metals Institute (IPMI) Student Award
- 2018 Chinese Award for Outstanding Self-Financed Students Abroad
- 2017 Outstanding Research Award, International Institute for Nanotechnology (Northwestern University)
- 2013 Excellence Award in National Undergraduate Innovation Training Program, China

PUBLICATIONS

[h-index: 21, i10-index: 23, total citations > 2079. Google Scholar [link](#).]

First and co-first author

1. **Wang, D.***; Yang, A. "Emerging Optics from Structured Nanoscale Optical Cavities," *Invited review, submitted to Progress in Quantum Electronics* (*corresponding author)
2. **Wang, D.**; Hu, J.; Schatz, G.C.; Odom, T.W. "Superlattice Surface Lattice Resonances in Plasmonic Nanoparticle Arrays with Patterned Dielectrics," *Journal of Physical Chemistry Letters* 14, 38, 8525–8530 (2023) DOI: 10.1021/acs.jpcllett.3c02158
3. **Wang, D.***; Dong, K.; Li, J.; Grigoropoulos, C.; Yao, J.; Hong, J.; Wu, J.* "Low-loss, geometry-invariant optical waveguides with near-zero-index materials," *Nanophotonics* 11, 21, 4747–4753 (2022) DOI: 10.1515/nanoph-2022-0445 (*corresponding author)
4. **Wang, D.**; Bourgeois, M.R.; Guan, J.; Fumani, A.K.; Schatz, G.C.; Odom, T.W. "Lasing from Finite Plasmonic Nanoparticle Lattices," *ACS Photonics* 7, 630-636 (2020) DOI: 10.1021/acsp Photonics.0c00231
5. Fernandez-Bravo, A.*; **Wang, D.***; Barnard, E.S.; Teitelboim, A.; Tajon, C.; Guan, J.; Schatz, G.C.; Cohen, B.E.; Chan, E.; Schuck, P.J.; Odom, T.W. "Ultralow-threshold, continuous-wave upconverting lasing from subwavelength plasmons," *Nature Materials* 18, 1172–1176 (2019) [Highlighted by News and Views, *Nature Materials*] DOI: 10.1038/s41563-019-0482-5 (*equal contribution)
6. **Wang, D.**; Guan, J.; Hu, J.; Bourgeois, M.R.; Odom, T.W. "Manipulating Light-matter Interactions in Plasmonic Nanoparticle Lattices," *Accounts of Chemical Research* 52, 2997-3007 (2019) DOI: 10.1021/acs.accounts.9b00345
7. **Wang, D.**; Bourgeois, M.R.; Lee, W.; Li, R.; Trivedi, D.; Knudson, M.P.; Wang, W.; Schatz, G.C.; Odom, T.W. "Stretchable Nanolasing from Hybrid Quadrupole Plasmons," *Nano Letters* 18, 4549–4555 (2018) DOI: 10.1021/acs.nanolett.8b01774
8. **Wang, D.**; Yang, A.; Wang, W.; Hua, Y.; Schaller, R.D.; Schatz, G.C.; Odom, T.W. "Band-edge Engineering for Controlled Multi-modal Nanolasing in Plasmonic Superlattices," *Nature Nanotechnology* 12, 889 (2017) [Highlighted by News and Views, *Nature Nanotechnology*] DOI: 10.1038/nnano.2017.126
9. **Wang, D.**; Wang, W.; Knudson, M.P.; Schatz, G.C.; Odom, T.W. "Structural Engineering in Plasmon Nanolasers," *Chemical Reviews* 118, 2865–2881 (2017) DOI: 10.1021/acs.chemrev.7b00424
10. Tran, T.T.*; **Wang, D.***; Xu, Z.-Q.*; Yang, A.; Toth, M.; Odom, T.W.; Aharonovich, I. "Deterministic Coupling of Quantum Emitters in 2D Materials to Plasmonic Nanocavity Arrays," *Nano Letters* 17, 2634-2639 (2017) DOI: 10.1021/acs.nanolett.7b00444 (*equal contribution)
11. **Wang, D.**; Yang, A.; Hryn, A.J.; Schatz, G.C.; Odom, T.W. "Superlattice Plasmons in

Hierarchical Au Nanoparticle Arrays," **ACS Photonics** 2, 1789 (2015) DOI: 10.1021/acsp Photonics.5b00546

Co-author

12. Dong, K.; Zhang, T.; Li, J.; Wang, Q.; Yang, F.; Rho, Y.; **Wang, D.**; Grigoropoulos, C.P.; Wu, J.; Yao J. "Flat bands in magic-angle bilayer photonic crystals at small twists," **Phys. Rev. Lett.** 126, 223601 (2021) DOI:10.1103/PhysRevLett.126.223601
13. Guan, J.; Sagar, L.K.; Li, R.; **Wang, D.**; Bappi, G; Wang, W.; Watkins, N.; Bourgeois, M.R.; Levina, L.; Fan, F.; Hoogland, S.; Voznyy, O.; Martins, J.; Schaller, R.D.; Schatz, G.C.; Sargent, E.H.; Odom, T.W. "Quantum dot-plasmon lasing with controlled polarization patterns," **ACS Nano** 14, 3426–3433 (2020) DOI: 10.1021/acsnano.9b09466
14. Guan, J.; Sagar, L.K.; Li, R.; **Wang, D.**; Bappi, G; Watkins, N.; Bourgeois, M.R.; Levina, L.; Fan, F.; Hoogland, S.; Voznyy, O.; Martins, J.; Schaller, R.D.; Schatz, G.C.; Sargent, E.H.; Odom, T.W. "Engineering Directionality in Quantum Dot Shell Lasing Using Plasmonic Lattices," **Nano Letters** 20, 1468-1474 (2020) DOI: 10.1021/acs.nanolett.9b05342
15. Lin, Y.; **Wang, D.**; Hu, J.; Liu, J.; Wang, W.; Schaller, R.D.; Odom, T.W. "Engineering Symmetry-breaking Nanocrescent Arrays for Nanolasing," **Adv. Funct. Mater.** 1904157 (2019) DOI: 10.1002/adfm.201904157
16. Hu, J.; **Wang, D.**; Bhowmik, D.; Liu, T.; Deng, S.; Knudson, M.P.; Ao, X.; Odom, T.W. "Lattice-Resonance Metalenses for Fully Reconfigurable Imaging," **ACS Nano** 13, 4613-4620 (2019) DOI: 10.1021/acsnano.9b00651
17. Ao, X.; **Wang, D.**; Odom, T.W. "Enhanced Fields in Mirror-backed Low-Index Dielectric Structures," **ACS Photonics** 6, 2612-2617 (2019) DOI: 10.1021/acsp Photonics.9b00931
18. Li, R.; **Wang, D.**; Guan, J.; Wang, W.; Ao, X.; Schatz, G.C.; Schaller, R.C.; Odom, T.W. "Plasmon nanolasing with aluminum nanoparticle arrays," **J. Opt. Soc. Am. B** 36, 104-111 (2019) DOI: 10.1364/josab.36.00e104
19. Liu, J.; Wang, W.; **Wang, D.**; Hu, J.; Ding, W.; Schaller, R.D.; Schatz, G.C.; Odom, T.W. "Spatially Defined Molecular Emitters Coupled to Plasmonic Nanoparticles," **Proc. Natl. Acad. Sci.** 116, 5925-5930 (2019) DOI.org/10.1073/pnas.1818902116
20. Hooper, D. C.; Kuppe, C.; **Wang, D.**; Wang, W.; Guan, J.; Odom, T.W.; Valev, V.K. "Second harmonic spectroscopy of surface lattice resonances," **Nano Letters** 19, 165-172 (2019) DOI: 10.1021/acs.nanolett.8b03574
21. Knudson, M.P.; Li, R.; **Wang, D.**; Wang, W.; Schaller, R.D.; Odom, T.W. "Polarization-Dependent Lasing Behavior from Low-Symmetry Nanocavity Arrays," **ACS Nano** 13, 7435-7441 (2019) DOI: 10.1021/acsnano.9b01142
22. Cherqui, C.; Bourgeois, M.R.; **Wang, D.**; Schatz, G.C. "Plasmonic Surface Lattice Resonances: Theory and Computation," **Accounts of Chemical Research** 52, 2548-2558 (2019) DOI:

10.1021/acs.accounts.9b00312

23. Li, R.; Bourgeois, M.R.; Cherqui, C.; Guan, J.; **Wang, D.**; Hu, J.; Schaller, R.D.; Schatz, G.C.; Odom, T.W. "Hierarchical Hybridization in Plasmonic Honeycomb Lattices," **Nano Letters** 19, 6435-6441 (2019) DOI: 10.1021/acs.nanolett.9b02661
24. **Wang, D.**; Wang, W.; Odom, T.W. *et al.* "Roadmap on Plasmonics: Nanoarray Lasing Spasers," **Journal of Optics** 20, 043001 (2018) DOI: 10.1088/2040-8986/aaa114
25. Trivedi, D.; **Wang, D.**; Odom, T.W.; Schatz, G.C. "Model for Describing Plasmonic Nanolasers Using Maxwell-Liouville Equations with Finite-difference Time-domain Calculations," **Phys. Rev. A** 96, 053825 (2017) DOI: 10.1103/PhysRevA.96.053825
26. Yang, A.; **Wang, D.**; Wang, W.; Odom, T. W. "Coherent Light Sources at the Nanoscale," **Annu. Rev. Phys. Chem.** 68, 83-99 (2017) DOI: 10.1146/annurev-physchem-052516-050730
27. Wang, S.; **Wang, D.**; Hu, X.; Li, T.; Zhu, S. "Compact Surface Plasmon Amplifier in Nonlinear Hybrid Waveguide," **Chinese Physics B** 25, 7 (2016)

Patent

1. Hong, J.; Wu, J.; **Wang, D.** "Method and Apparatus of Hybrid Integrated Photonics Devices" (US Patent Application no. 18,111,532)—filed on Feb. 18 2023

RESEARCH EXPERIENCE

University of California, Berkeley, Berkeley, CA

- Postdoctoral research hosted by Junqiao Wu

Highlight activities include:

- Achieved long-range optical interactions between epsilon-near-zero thin film materials and their analogy to superconducting proximity effect in electronic systems
- Demonstrated that near-zero-index materials can serve as a cladding layer for low-loss and geometry-invariant optical waveguides for miniaturized photonics

These works are funded by the Miller research fellowship.

Northwestern University, Evanston, IL

- Graduate research co-advised by Teri W. Odom and George C. Schatz

Highlight activities include:

- Achieved controlled multi-modal lasing from metal nanoparticle superlattices that enable access to multiple band-edge states in the photonic band structure
- Realized a mechanically tunable nanolaser based on metal nanoparticles on a flexible polymer matrix, as inspired by color changes of chameleons in nature
- Collaboratively demonstrated deterministic coupling of quantum emitters in hBN to plasmonic nanocavities for enhanced single-photon emission

- Collaboratively achieved continuous-wave nanoscale lasing at visible frequencies under near-infrared pumping with *record-low* power thresholds
- Established a robust computational approach in finite-difference time-domain methods to investigate time- and spatial- dependent lasing buildup in small photonic cavities

These works resulted in 8 first-author publications in Nature Nanotechnology, Nature Materials, Nano Letters, ACS Photonics etc.

CONFERENCES & PRESENTATIONS

- 1. International Workshop on Quantum Materials for 2D Photonics & Optoelectronics**
Singapore 2023
Invited talk: “Emerging Optics from Structured Nanoscale Cavities”
- 2. MRS Fall Meeting**
Boston, MA 2022
Talk: “Low-loss, geometry-invariant optical waveguides with zero-index materials”
- 3. San Francisco State University Physics Colloquium**
San Francisco, CA 2022
Invited talk: “Emerging Optics from Structured Nanomaterials”
- 4. UC Berkeley Quantum Materials Seminar**
Berkeley, CA 2019
Invited talk: “Extraordinary Optics from Structured Nanoparticles”
- 5. UC Berkeley Nano Seminar Series**
Berkeley, CA 2019
Invited talk: “Extraordinary Optics from Structured Nanoparticles”
- 6. ACS Fall Meeting**
San Diego, CA 2019
Invited talk: “Extraordinary Optics from Structured Nanoparticles”
- 7. Vannevar Bush Faculty Fellows Annual Meeting**
Washington, D.C. 2019
Poster: “Functional and Hierarchical Nanoscale Metamaterials”
- 8. MRS Fall Meeting**
Boston, MA 2018
Talk: “Stretchable Nanolasing from Hybrid Quadrupole Plasmons”
- 9. Gordon Conference**
Waterville Valley, NH 2018
Poster: “Structural Engineering in Plasmon Nanolasers”
- 10. Nanjing University Tiandi Symposium**
Nanjing, China 2017
Invited talk: “Structural Engineering in Plasmon Nanolasers”
- 11. MRS Fall Meeting**
Boston, MA 2017
Talk: “Band-edge Engineering for Controlled Multi-modal Nanolasing in Plasmonic Superlattices”
- 12. Northwestern SPIE-MRSEC Student Seminar Series**
Evanston, IL 2017
Invited talk: “Structural Engineering in Plasmon Nanolasers”

13. **OSA Incubator on Science & Applications of Nanolasers** Washington, DC 2016
Invited talk: "Lasing from Plasmonic Nanocavity Arrays"
14. **Gordon Conference** Newry, ME 2016
Poster: "Band-edge Engineering in Hierarchical Plasmonic Nanolasers"
15. **APS March Meeting** San Antonio, TX 2015
Poster: "Superlattice Plasmons in Finite Nanoparticle Arrays"

PRESS RELEASES

1. "Structuring Nanomaterials for Optics", *Miller Fellow Focus, Miller Institute Newsletter* (Winter 2021)
2. "Forbes 30 Under 30 2021 List", *Forbes* (December 2020)
3. "Upconverting Nanolasers from Subwavelength Plasmons: Stability and Ultralow Powers", *energy.gov* (March 2020)
4. "Tiny laser packs a punch", *Berkeley Lab's Molecular Foundry News* (Nov. 2019)
5. "Tiny, biocompatible laser could function inside living tissues", *National Science Foundation Research News* (Oct. 2019)
6. "Biocompatible nanolaser small enough to treat brain diseases", *springwise.com* (Oct. 2019)
7. "Lasing under ultralow pumping", *Nature Materials News and Views* (Oct. 2019)
8. "Tiny, Biocompatible Laser Could Function Inside Living Tissues", *Columbia Engineering News* (Oct. 2020)
9. "Tiny, biocompatible laser could function inside living tissues", *phys.org* (Sep. 2020)
10. "Tiny, biocompatible nanolaser could function inside living tissues", *Northwestern Now* (Sep. 2019)
11. "Nanolaser functions inside living human tissue", *Laboratory News* (Sep. 2019)
12. "Tiny, biocompatible laser could function inside living tissues", *Nanotechnology Now* (Sep. 2019)
13. "The chameleon and the crystal maze", *Laboratory News, UK* (Sep. 2018) [Highlighted as the featured article and the cover story]
14. "Mimicking the Master of Camouflage", *Chicago Biomedical Consortium Success Story* (July 2018)
15. "Nanolaser Changes Color when Stretched", *Chemical & Engineering News* (July 2018)
16. "Chameleon-inspired Nanolaser Changes Colors", *National Science Foundation's webhomepage* (June 2018)
17. "Chameleons Inspire Mechanochromic Nanolaser", *Physics World* (June 2018)

18. "Chameleon-inspired Nanolaser Changes Colors", *ScienceDaily* (June 2018)
19. "Chameleon-inspired Nanolaser Changes Colors", *Northwestern Now* (June 2018)
20. "Northwestern's New Chameleon-Inspired Laser Changes Colors", *WTTW* (June 2018)
21. "Nanolasing: Multimode Superlattice Arrays", *Nature Nanotechnology News and Views* (Sep. 2017)
22. "New Laser Design Offers More Inexpensive Multi-color Output", *Northwestern Now* (July 2017)
23. "Controlling Multi-modal Nanolasing with Plasmonic Superlattices", *Nanowerk News* (July 2017)

PROFICIENCIES AND SKILLS

Nanofabrication

Bench-top Multi-scale Pattern Transferring, Phase-shift Photolithography, E-beam Lithography, Pulsed Vapor Deposition, E-beam Evaporation, Reactive Ion Etching, Scanning Electron Microscopy

Optical characterization

Optical Set-up, Lasing Detection, Time-resolved Photoluminescence, Angle-resolved Optical Spectroscopy, Dark-field Microscopy, Raman spectrometer

Modeling and Computation

Finite-Difference Time-Domain (FDTD) Modeling, COMSOL Multiphysics, MATLAB, Mathematics, Adobe Illustrator, Blender 3D Software

LEADERSHIP EXPERIENCE

- 2020-23 Glovebox, Raman Spectrometer Instrument Manager, the Wu Group
- 2019-23 Microscope Instrument Manager, the Wu Group
- 2016-18 Laser Instrument Manager, the Odom Group
- 2015-17 Rotational-stage Spectrometer Manager, the Odom Group
- 2016 Management for Scientists and Engineers Certificate, Northwestern University, Kellogg School of Management
- 2014-15 Cleanroom Manager, the Odom Group

TEACHING EXPERIENCE

Guest Lecturer, University of California, Berkeley

Fall 2019

Course: Optical Materials and Devices

Responsibilities: Invited to present one lecture on my research work to graduate students. Developed and delivered a 90-minute lecture with interactive sections.

Graduate Teaching Assistant, Northwestern University

Spring 2018

Course: Introductory Physics of Materials

Responsibilities: Hosted the office hours, refined assignments questions, and graded for an undergraduate-level course with 22 students.

SERVICE & OUTREACH

Co-chair, Gordon Research Seminar

June 2023

Subsection: Lasers in Micro, Nano and Bio Systems, West Dover, VT

Miller Institute Ambassador

2022

University of California, Berkeley

Invited panelist, WISE National Conference, Canada

Jan. 2022

University of Toronto

“Meet with a Miller Fellow” outreach program at El Cerrito High School

2020-21

University of California, Berkeley

Morning mentor, Tutoring program at Nichols Middle School

Winter 2018

Northwestern University

Professional Development Co-chair, McCormick Graduate Leadership Council

2014-16

Northwestern University

Ad Hoc Reviewer

ACS Photonics, Optica, Optics Letters, Applied Optics, Optics and Laser Technology, Materials

REFERENCE CONTACTS

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Professor Junqiao Wu

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Professor Teri W. Odom

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Chair, Department of Chemistry, Northwestern University; Editor-in-Chief, *Nano Letters*

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Professor George C. Schatz

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